

# A NEW ENCOMPASSING THEORY OF SCIENCE IN IBN SĪNĀ\*

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Until recent times, the study of Ibn Sīnā (Avicenna) was mainly limited to metaphysics and psychology. Logic and epistemology, especially, received little to no attention. However, since the last decade of the previous century, the number of publications dealing with these topics has increased substantially.<sup>1</sup> In the West, the previous absence of interest in these domains was unmistakably due to the lack of a medieval Latin translation of Ibn Sīnā's logical texts (with the exception of the *Isagoge* of the *Shifā'*), as well as the existence of a rather limited number of translations in contemporary Western languages, even if in the last decade (and especially the last five years) several translations of logical books of the *Shifā'* have been published.<sup>2</sup> Most surprisingly, as far as the *Posterior Analytics*, the *Kitāb al-*

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\* RICCARDO STROBINO, *Avicenna's Theory of Science. Logic, Metaphysics, Epistemology*, University of California Press, Oakland (California) 2021. I would like to express my gratitude to the anonymous reviewer for their observations and to Brian Garcia for revising my English.

<sup>1</sup> This increase is evidenced by the mention of less than fifty titles spanning twenty years of publications in this field, i.e. 1970–1989, to over two hundred in the next twenty years. On this, see my *An Annotated Bibliography on Ibn Sīnā (1970–1989). Including Arabic and Persian Publications, and Turkish and Russian References*, Leuven University Press, Leuven 1991 (Ancient and Medieval Philosophy. Series I, 13), p. 131–147; *An Annotated Bibliography on Ibn Sīnā: First Supplement (1990–1994)*, FIDEM, Louvain-la-Neuve 1999 (Textes et Études du Moyen Âge, 12), p. 63–75; and my *An Annotated Bibliography on Ibn Sīnā: Second Supplement (1995–2009)*, Arizona Center for Medieval and Renaissance Studies, Tempe (Arizona) 2017 (Medieval and Renaissance Texts and Studies, 439), p. 187–243. In recent times, this increasing interest has been further evidenced by the publication of two monographs, i.e., ALEXANDER KALBARCZYK, *Predication and Ontology. Studies and Texts on Avicennian and Post-Avicennian Readings of Aristotle's «Categories»*, De Gruyter, Berlin–Boston 2016 (Scientia Graeco-Arabica, 22) and FEDOR BENEVICH, *Essentialität und Notwendigkeit. Avicenna und die aristotelische Tradition*, Brill, Leiden–Boston 2018 (Islamic Philosophy, Theology and Science, 107).

<sup>2</sup> English translations of the four complete books of the logical part of the *Shifā'* do exist: *Isagoge*, twice translated – namely AVICENNA/IBN SĪNĀ, *Al-Madkhal. Avicenna on the Isagoge of Porphyry*, trans. ALLAN BÄCK, Philosophia Verlag, München 2019 (Analytica Liber Conversus), and SILVIA DI VINCENZO, *Avicenna: The Healing, Logic: Isagoge. A New Critical Edition, English Translation and Commentary*

*Burhān* of the *Shifā'*, is concerned, one looks in vain for any translation of a substantial part of it.<sup>3</sup> This is all the more surprising insofar as Gundissalinus inserted the Latin translation of the seventh chapter of book two, entitled in the Arabic « *Fī ikhtilāf al-ʿulūm wa-ishtirākīhā bi-qawl mufaṣṣal* (On the Difference and Similarity Between the Sciences by Means of a Detailed Account) », into his famous work, *De divisione philosophiae*. Already in 1984, Hugonnard-Roche stressed the importance of this translation, and its impact on Gundissalinus's own theory of science.<sup>4</sup> However, for a contemporary translation, one had to wait until 2010 –

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of the *Kitāb al-Madhāl* of Avicenna's *Kitāb al-Shifā'*, De Gruyter, Berlin – Boston 2021 (Scientia Graeco-Arabica, 31); *Categories*, in AVICENNA/IBN SĪNĀ, *Al-Maqūlāt. Commentary on Aristotle's Categories*, trans. ALLAN BÄCK, Philosophia Verlag, München 2016 (Analytica Liber Conversus); *On Interpretation*, in AVICENNA/IBN SĪNĀ, *Al-'Ibārā. Avicenna's Commentary on Aristotle's De Interpretatione. Part One and Part Two*, trans. ALLAN BÄCK, Philosophia Verlag, München 2013 (Analytica Liber Conversus); and *Poetics*, in ISMAIL M. DAHIYAT, *Avicenna's Commentary on the Poetics of Aristotle*, Brill, Leiden 1974, p. 61–121. There exists also an English translation of a substantial part of the *Prior Analytics*, i.e. V–VII, VIII, 1–2 and IX, 1, in NABIL SHEHABY, *The Propositional Logic of Avicenna. A Translation from al-Shifā': al-Qiyās*. D. Reidel, Dordrecht – Boston 1973 (Synthese Historical Library). Additionally, a French translation of Book I of the *Dialectics* should be noted, in AVICENNE (IBN SĪNĀ), *La Dialectique. Livre I du Kitāb al-Ġadal*, trans. FOUAD MLIH, Vrin, Paris 2023 (Études Musulmanes, 56), as well as a German translation of Book I of the *Rhetoric* in RENATE WÜRSCH, *Avicennas Bearbeitungen der aristotelischen Rhetorik: ein Beitrag zum Fortleben antiken Bildungsgutes in der islamischen Welt*, Klaus Schwab Verlag, Berlin 1991 (Islamkundige Untersuchungen, 146), p. 140–174. Besides the *Shifā'*, the logical part of three of Ibn Sīnā's *Summae*, i.e. *al-Najāt*, *Daneshname-ye Ala'i* and *al-Ishārāt wa-l-tanbīhāt*, has been translated in English and/or French: see, respectively, ASAD Q. AHMED, *Avicenna's Deliverance: Logic*, Oxford University Press, Oxford 2011 (Studies in Islamic Philosophy); MOHAMMAD ACHENA, HENRI MASSÉ, *Avicenne: Le livre de science*, vol. I: *Logique, Métaphysique*; vol. II: *Science naturelle, Mathématiques*, ed. MOHAMMAD ACHENA, Les Belles Lettres – UNESCO, Paris 1986 (Traductions de textes persans publiées sous le patronage de l'Association Budé), p. 65–130 [revised translation of the 1955–1958 edition]; IBN SĪNĀ (AVICENNE), *Livre des directives et des remarques (Kitāb al-Iṣārāt wa l-tanbīhāt)*, trans. ANNE-MARIE GOICHON, Commission internationale pour la traduction des chefs-d'oeuvre – Vrin, Beyrouth – Paris 1951 (Collection d'oeuvres arabes de l'Unesco), p. 81–245, and IBN SĪNĀ, *Remarks and Admonitions, Part One: Logic*, trans. SHAMS C. INATI, PIMS, Toronto (Ontario) 1984 (Mediaeval Sources in Translation, 28). As for the English translation of FARHANGI ZABEEH, *Avicenna's Treatise on Logic. Part One of Danesh-name alai* [A Concise Philosophical Encyclopaedia] and Autobiography, Martinus Nijhoff, The Hague 1971, p. 12–47, it is extremely weak, and of no real use.

<sup>3</sup> As far as I know, only four chapters (in full) have so far received an English translation – i.e. I, 6 in MICHAEL E. MARMURA, « Avicenna on Meno's Paradox: On 'Apprehending' Unknown Things Through Known Things », *Mediaeval Studies*, 71 (2009), p. 49–62; I, 9 and III, 5 in JOHN MCGINNIS, DAVID C. REISMAN, *Classical Arabic Philosophy. An Anthology of Sources*, Hackett Publishing Company, Indianapolis – Cambridge 2007, p. 147–156; and II, 4 in RICCARDO STROBINO, « Avicenna on the Indemonstrability of Definition », *Documenti e studi sulla tradizione filosofica medievale*, 21 (2010), p. 113–163, especially p. 148–162.

<sup>4</sup> HENRI HUGONNARD-ROCHE, « La classification des sciences de Gundissalinus et l'influence d'Avicenne », in JEAN JOLIVET, ROSHDI RASHED (eds.), *Études sur Avicenne*, Les Belles Lettres, Paris 1984 (Sciences et philosophies arabes. Études et reprises), p. 41–75.

this appeared appended to a paper where Strobino discussed in detail the structure and textual issues related to the Arabic text, but with a specific eye on Gundissalinus's translation.<sup>5</sup>

But, of course, this single chapter does not tell the whole story about Ibn Sīnā's theory of science. An encompassing study of many other parts of the *Kitāb al-Burhān* of the *Shifā'* is clearly required in order to grasp it in a more complete and serious way. Strobino was well aware of this and has taken it as the basis for his presentation.<sup>6</sup> But he did not simply limit himself to this sole book. He pays additional attention to significant passages in other logical books of the *Shifā'*, especially *al-Madkhal* (*Isagoge*), *al-Qiyās* (*Prior Analytics*) and *al-Jadal* (*Topics*), as well as in the logical sections of three other of Ibn Sīnā's *Summae*, i.e. *al-Najāt*, *Daneshname-ye 'Ala'i*, and *al-Ishārāt wa-l-tanbīhāt*.<sup>7</sup> Moreover, given that Aristotle's ideal of demonstration poses a serious problem of applicability in practice, Strobino points out relevant passages in the natural and mathematical books of the *Shifā'*, above all, *al-Samā' at-ṭabī'i* (*Physics*) and *al-Handasa* (*Geometry*), in order to clarify this issue. Finally, in a more than incidental way, he quotes passages of its *Ilāhiyyāt* (*Metaphysics*) – he does this in order to show that Ibn Sīnā's theory of science is part of a coherent philosophical project. It is immediately obvious that this is a most encompassing and ambitious project, which, moreover, deserves the full label of a pioneering study.

Since it is impossible to discuss in detail all the ideas expressed in the book, I will limit myself to highlight a few of Strobino's major insights. Their particular significance for a good understanding of Ibn Sīnā's thought in general, and of his theory of scientific reasoning in particular, is beyond doubt. Nevertheless, some details of his interpretation are far from evident, or even disputable, and therefore in need of – at least – further investigation.

From a historical point of view, it is absolutely clear that Aristotle's *Posterior Analytics* constitutes the ultimate source of inspiration for Ibn Sīnā's *Burhān*. But it is also evident that the latter contains many elements that are innovative compared to the former. In fact, Ibn Sīnā substantially recalibrates the model of Aristotle's work because he has as his aim the maximalisation of its applicability. In this sense, it comes somehow as a surprise that his requirements for scientific knowledge remain at least as strict as, and perhaps are even stricter than, those of

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<sup>5</sup> See *supra*, n. 4.

<sup>6</sup> This is evidenced by the Indices on the lemmata (with a few exceptions all derived from the *Burhān*) and of Avicenna's works with passages cited (where those of the *Burhān* cover – more or less – half of all passages quoted), see STROBINO, *Avicenna's Theory of Science*, p. 413–423.

<sup>7</sup> It must be stressed that with regard to the *Daneshname-ye 'Ala'i*, no textual passage is extensively quoted, but all references concern a general remark on either a basic idea or a technical term; moreover, they are always based on the French translation of 1955, as referred to in note 3 (hence, unfortunately lacking a reference to the 1986 revised edition).

Aristotle. I agree with Strobino that Ibn Sīnā is not particularly concerned about the problem of how a greater applicability can be combined with so strict criteria. But I wonder whether Strobino does not minimalize too much its problematic nature by invoking Ibn Sīnā's adherence to a «unwavering metaphysical essentialism and staunch epistemological optimism». <sup>8</sup> One thing is to say that such adherence may have played a role in Ibn Sīnā's slight concern for solving the problem, another is to present it almost as an excuse, while claiming that

in light of these two factors, the prospect that a suitable body of knowledge might satisfy the criteria of scientific knowledge and count as a science is much less unrealistic than may otherwise appear to the mind of the modern reader (or even any skeptics among Avicenna's immediate readers). <sup>9</sup>

This latter affirmation, as such, is true; however, « is much less unrealistic than may otherwise appear » does not mean « is fully realistic otherwise than may appear ». Moreover, its truth is based on the acceptance of the broader framework of Ibn Sīnā's thought, especially his metaphysical essentialism and epistemological optimism, which, in fact, is owed to Ibn Sīnā's metaphysical optimism. <sup>10</sup> But how rationally warranted are these two basic assumptions? Finally, one has the impression that in the background of this interpretation lies the idea of a great inner coherence within Ibn Sīnā's philosophical system. Even if I admit that Ibn Sīnā, as all other great thinkers, tries to remain as coherent as possible, and perhaps realises this in a better way than Aristotle had done before him, his system is not totally free from inner tensions. One example of this is present in his affirmation of a divine knowledge of particulars, which, even with the additional qualification of 'in a universal way', can hardly be combined in a logical coherent way with his defense of the strict unity of God. Moreover, Ibn Sīnā's system is not completely free from ambiguities – one illustration of which can be found in Ibn Sīnā's mention of a second kind of belief (*i'tiqād*) related to an assertion (*taṣḍīq*), namely whether it introduces a modal characterization of the first belief, or of its content. <sup>11</sup>

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<sup>8</sup> STROBINO, *Avicenna's Theory of Science*, p. 332.

<sup>9</sup> STROBINO, *Avicenna's Theory of Science*, p. 332.

<sup>10</sup> The dependence of Ibn Sīnā's epistemological optimism on his metaphysical optimism is stressed by Strobino himself; see STROBINO, *Avicenna's Theory of Science*, p. 306.

<sup>11</sup> Regarding Ibn Sīnā's affirmation of God's knowledge of the particulars, there exist several publications, among which, from a logical point of view, the most significant are PETER ADAMSON, « On Knowledge of Particulars », *Proceedings of the Aristotelian Society*, 105 (2005), p. 273–294; AMIRHOSSEIN ZADYOUSEFI, « On Knowledge of Particulars, Does God Know that *the Flower in My Hand is Red*? Avicenna and the Problem of God's Perceptual Knowledge », *Sophia*, 59 (2020), p. 657–693, and JARI KAUKUA, « Future Contingency and God's Knowledge of Particulars », *British Journal for the History of Philosophy*, published online 2022 (open access); regarding the issue of belief, see STROBINO, *Avicenna's Theory of Science*, p. 41–44. Strobino rightly notes that the first hypothesis

Even if Ibn Sīnā is not the inventor of the distinction between *taṣawwur* (conception) and *taṣdīq* (assertion), his particular insistence on the existence of them as first principles turns out to be innovative. He thus expresses his profound adherence to foundationalism. However, Ibn Sīnā offers almost no details regarding the existence of primary notions, in spite of his having explicitly affirmed that such a foundationalist approach inevitably implies the need to have first principles of conception.<sup>12</sup> In his *Burhān*, one looks in vain for any concrete example. However, as Strobino notes, the remarks about « prior in nature » or « better known in nature » (present in the same work I.11), indicate that he had in mind notions of the highest generality, and of which Ibn Sīnā offers examples in the *Ilāhiyyāt* of the *Shifā'*, I, 5.<sup>13</sup> In view of this, the fact that Ibn Sīnā accepts the existence of primary notions is indeed beyond doubt. His admission of the existence of a close link between logic and metaphysics is also clear – and this is in line with the general basic insight, well argued for in Strobino's work, that logic is of utmost importance for a correct understanding of how Ibn Sīnā articulates the different disciplines included in his encompassing philosophical project. However, it should be stressed that, with regard to primary notions, the role of logic seems to be limited to express a basic need for them: given their being of the

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would result in « the weaker claim that the certainty of demonstrative discourse concerns the *epistemic* necessity of certain sets of belief », while the second would seem to imply « the stronger claim that the certainty of demonstrative discourse concerns the *ontological* necessity of a privileged class of facts ». As to his preference of 'assertion' as translation for *taṣdīq*, see *ibid.*, p. 13, n. 1, which, at least at first sight, seems convincing. Let us add that Strobino is (strongly) inclined to bridge the apparent gap between epistemic and ontological necessity by insisting that Ibn Sīnā leaves no space for contingent truths, but, with regard to necessary truths, « is willing to admit (...) not exclusively (...) eternal facts, but also facts that hold necessarily but for a limited amount of time ». This is an interesting remark, but is it based on an explicit affirmation of Ibn Sīnā, or a personal judgment, and, if so, on what precise basis?

<sup>12</sup> IBN SĪNĀ, *al-Shifā'*, *al-Mantiq*, *al-Burhān* I.6, ed. ABŪ AL-'ALĀ 'AFĪFĪ, Al-maṭba'a al-amīriyya, Cairo 1956, p. 77, 1–5; English translation STROBINO, *Avicenna's Theory of Science*, p. 28, Text 1.7.

<sup>13</sup> Strobino only presents the list of examples that is given at the beginning of the chapter, i.e. « 'existent', 'thing', 'necessary' », but it would have been good if he had added a – at least, small – reference as well to the second, slightly modified list of such examples, i.e. « 'existent', 'thing', 'one', and so on », which is mentioned somewhat later in the chapter (see IBN SĪNĀ, *al-Shifā'*, *al-Ilāhiyyāt* (1) I.5, ed. GEORGES C. ANAWATI, SA'ĪD ZAYED, Al-Hay'a al-āmma li-shu'ūn al-maṭābī' al-amīriyya, Cairo 1960, p. 30, 4 [reading *wa-l-shay' wa-l-wāhid*, according to the list of corrections, present in AVICENNA (IBN SĪNĀ), *Libro della guarigione. Le cose divine*, ed. AMOS BERTOLACCI, UTET, Torino 2007 (Classici del pensiero), p. 115]). Of course, the given reference suffices to show the acceptance of primary conception in Ibn Sīnā, but the non-absolute identity between the two lists indicates that he was hesitant to restrict them to a very precise number of a few given conceptions, even if it cannot be very high. Note, moreover, that in view of the doctrine of transcendentals in the Latin scholasticism, this double list is particularly interesting, see JORGE USCATESCU BARRÓN, *Der begriff des Guten – Eine historisch-systematische Untersuchung. Mittelalterliche Philosophie von Augustinus bis Suárez*, Verlag Karl Alber, Freiburg – München 2021 (Scientia & Religio, 16), p. 221–225.

highest generality, their identification and the explanation of their specific roles can only belong to the highest science, i.e. metaphysics. On the contrary, the elucidation of primary assertions is fully developed and illustrated in logic, but only vaguely referred to in metaphysics – mostly, limited to show a basic similarity in function between them and primary notions.<sup>14</sup> Unless I am mistaken, this shows that logic is, properly speaking, an instrumental science, which explores the methods for correct reasoning. But even then, it poses solid foundations for all the other sciences, including metaphysics. For example, in discussing the principles of the sciences, Ibn Sīnā, in his *Burhān*, distinguishes – besides two other ones (i.e. proper to each science or common to several sciences) – a mode common to all, being illustrated by: « Of everything either the affirmation or the negation is truthfully asserted ».<sup>15</sup> With explicit reference to the *Burhān*, Ibn Sīnā speaks anew about it in his *Ilāhiyyāt*, as follows:

And the most primary of all true statements, to which everything in analysis reduces (so that it can be predicated either potentially or actually of all things demonstrated or made evident through it), is – as we have shown in the *Book of Demonstration* – [as follows]: ‘There is no intermediary between affirmation and negation’.<sup>16</sup>

Through this wording, he approves on an ontological level the validity of the absolute primacy of the truth of the assertion of the absence of an intermediary between affirmation and negation, given its applicability to all things that it demonstrates.<sup>17</sup> This generality makes it understandable that for its ultimate ontological foundation, it receives acute attention in metaphysics, as the encompassing study of existence (or, being).<sup>18</sup>

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<sup>14</sup> See IBN SĪNĀ, *al-Shifāʾ, al-Burhān* I.4, p. 64, 3–4, respectively IBN SĪNĀ, *al-Shifāʾ, al-Ilāhiyyāt* I.5, p. 29, 5–30, 2.

<sup>15</sup> IBN SĪNĀ, *al-Shifāʾ, al-Burhān* II.6, p. 155, 10–14; English translation STROBINO, *Avicenna’s Theory of Science*, p. 88–89, Text 4.2.

<sup>16</sup> IBN SĪNĀ, *al-Shifāʾ, al-Ilāhiyyāt* I.8, p. 48, 14–16; English translation AVICENNA, *The Metaphysics of The Healing*, ed. and trans. MICHAEL E. MARMURA, Brigham Young University Press, Provo (Utah) 2005 (Islamic Translation Series), p. 39, 6–10 (very slightly modified).

<sup>17</sup> More specifically, it is one of the essential accidents of existent qua existent – I owe this observation to the anonymous reviewer.

<sup>18</sup> Even if *wujūd* is most commonly rendered by « existence » in contemporary Avicennian scholarship, I still remain hesitant about the validity of this translation in all cases where the former Arabic term appears. Certainly, I do not deny that in some cases this translation is correct, and indeed imposes itself, but in absence in Arabic of a verb that corresponds with the copula « to be », and in view, moreover, of the fact that Ibn Sīnā, in his *Daneshname-ye Alaʾi*, seems to make a distinctive use between *vujūd* and *hasti*, I have the impression that on some occasions the translation « being » looks doctrinally preferable – but this requires further investigation.

As to defining the internal structure of each science, as well as the specification of the interrelations between the different sciences, Ibn Sīnā, compared to Aristotle, is largely innovative. Regarding the issue of the internal structure of each science, one of his crucial innovations consists in the making an explicit distinction with regard to scientific questions, i.e. the propositions that a science aims to establish by demonstration, between simple categorical and compound hypothetical. Here, it is worthwhile to quote in full the following remark of Strobino:

The philosophical significance of the distinction (...) cannot be overestimated. This is because it single-handedly broadens the set of fundamental expressions that may be used in scientific discourse, addressing a classical problem associated with the tradition of the two *Analytics*, namely the question of their expressive power and applicability to actual scientific theories. As noted, even in the putative form of a complete science in its final stage (and leaving aside the fact that the Aristotelian science actually exhibits this form, at least in his surviving works), it would be hard to see how far one could go, in any science, with the sole aid of categorical propositions and categorical syllogistic.<sup>19</sup>

One cannot but agree with him that the abandonment of a strict categorical approach helped to overcome the sometimes too harsh restrictions of Aristotle's theory of science. However, as judiciously noted by him, this « does not affect the pre-eminent role still played by categorical propositions in his [= Ibn Sīnā's] logic of scientific discourse ». Regarding Ibn Sīnā's detailed and systematic attempt to offer a logically coherent justification for a hierarchical order between the sciences, particular attention is owed to the case of subordination due to a foreign non-per se accident of a species of a different subject, illustrated by the subordination of music to arithmetic. A most telling passage is present at the beginning of the *Jawāmi' 'ilm al-Mūsīqā* of the *Shifā'*:

The physical principles only occur in this science [i.e. music] insofar as its subject is physical; hence, if one wants to establish firmly the status of the subject of this science by means of admitted principles, (these latter) cannot be otherwise than natural. As to the numerical principles, they enter this science from the point of view of the form that follows (*talḥaqa*) the subject-matter (*mawḍū'*) of this science, and consequently, the connection with them becomes the subject of this science as you have learnt in the *Book of Demonstration*. The predisposition of this form [reading *isti'adāduhā* instead of *isti'adāduhu*) is in view of a numerical proportion, by means

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<sup>19</sup> STROBINO, *Avicenna's Theory of Science*, p. 100.

of which the [specific] subject of concordance or discordance happens to exist among particular (sounds).<sup>20</sup>

Most interestingly, Ibn Sīnā does not only remain in line with what he had said about this subordination in his *Burhān*, but he even adds an explicit reference to the latter. However, it is obvious that he is not really at ease with how to include music in a coherent manner in an encompassing framework of the subordination of all sciences. Although the composition of the *Jawāmi‘ ‘ilm al-Mūsīqā* is, in all likelihood, later than most other parts of the *Shifā’*, Ibn Sīnā, in spite of his final qualification of the science of music as a mathematical science, still feels the need to explicitly note that it is based on principles that belong to the domain of natural science.<sup>21</sup> Most importantly, he, in the *Muqaddima (Preface)*, stresses: « Before penetrating the proper core of this art (*ṣarīḥ hādhihi l-ṣinā’*) we present a preamble that has no connection with mathematics, nor a strong analogy with all what we have said before about the principles of the sciences ». <sup>22</sup> As far as I know, this is the only text where Ibn Sīnā feels the need to add a kind of introduction that falls outside the proper subject of the science under investigation. In what follows, sound is presented as an external sensation that in principle is agreeable – as established in the study of the external sense of hearing (part of the study of the human soul, and hence having its place in the natural sciences). Furthermore, it is qualified as something necessary for both animals and man, namely with regard to the preservation, above all, of their species, and, to a lesser extent (especially in animals), of their personal life (expressing a teleology, which is an essential part of metaphysics).<sup>23</sup> In offering these specifications, Ibn Sīnā clarifies that he rejects the Pythagorean-Platonic view of the existence of a universal numeric harmony, which corresponds to that of music and which includes a substantial impact of music on the soul. For him, sound, even if it lies at the basis of musical harmony and rhythm, is essentially a natural phenomenon, and, as such, its study can only figure inside the natural sciences. On the other hand, sound fulfills a crucial role

<sup>20</sup> IBN SĪNĀ, *al-Shifā’*, *al-Riyādiyāt*, *Jawāmi‘ ‘ilm al-Mūsīqā* I.1, ed. ZAKARIYĀ YUSŪF, Al-Hay’a al-miṣriyya al-‘amma li-l-kitāb, Cairo 1956, p. 10, 1–5.

<sup>21</sup> Regarding the *Jawāmi‘* as one of the latest composed books of the *Shifā’*, see DIMITRI GUTAS, *Avicenna and the Aristotelian Tradition. Introduction to Reading Avicenna’s Philosophical Works*. Second, Revised and Enlarged Edition, Including an Inventory of Avicenna’s Authentic Works, Brill, Leiden – Boston 2014 (IPTS 89), p. 108. It is perhaps worthwhile to note that Ibn Sīnā, with the exception of the *Shifā’* (and, maybe, the *Najāt*), seems never have paid any attention to this science. Moreover, in the opening sentence of the *Jawāmi‘*, he stresses that he limits himself to what is strictly essential to this science, see IBN SĪNĀ, *al-Shifā’*, *Jawāmi‘ ‘ilm al-Mūsīqā*, Preface, p. 3, 7–8.

<sup>22</sup> IBN SĪNĀ, *al-Shifā’*, *Jawāmi‘ ‘ilm al-Mūsīqā*, Preface, p. 4, 10–11.

<sup>23</sup> Concerning Ibn Sīnā’s conception of teleology as underlying his expression of the survival of species, without excluding the welfare of the individual life (even in animals), see BETHANY SOMMA, « Avicenna on Animal Goods », *Journal of Islamic Ethics*, 6 (2022), p. 19–53, especially p. 36–41.



in the ‘emanative’ providential order (where God functions as a remote cause of everything)<sup>24</sup> – namely, it contributes to the preservation of the species, and even, on occasion, the individual life of animals and man, but this has nothing to do with its musical understanding. In a final remark, Ibn Sīnā insists that the harmony of music can seduce us, and procure us a sense of pleasure, but this is not based on the mere notes, but rather on the way we experience them. In an undoubtedly Aristotelian inspired way, he therefore encloses the proper study of music in mathematics. Its status as a science is clearly quite unique, but does this mean that its subordination to arithmetic must be qualified as « awkward », as Strobino (p. 119) does? Would it not be more adequate to label it – more positively – « special »?

Of particular significance for Ibn Sīnā’s theory of science is his essentialism. Hence, necessity becomes a crucial factor. However, necessity has many meanings for him. In his modal logic, Ibn Sīnā distinguishes between two modes of reading propositions in a necessary mode, i.e. *dhātī* and *wasfī*, as they usually became called in the post-Avicennian tradition. If the translation « descriptive » for the latter of these two terms does not pose any serious problem, that of « referential », withheld by Strobino, with regard to the former, is not evident in the same way.<sup>25</sup> Unfortunately, he does not offer any explicit justification for his terminological choice, but it seems to be based on the – plausible, albeit not self-evident – view that for Ibn Sīnā « a *dātī* proposition may take an arbitrary term as its subject », hence does not require a substance term or an essence term.<sup>26</sup> The absence of any justification is, in all likelihood, largely due to the fact that the descriptive

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<sup>24</sup> Regarding Ibn Sīnā’s conception of providence, see my « What about Providence in the Best of All Possible Worlds? Avicenna and Leibniz », in PIETER D’HOINE, GERD VAN RIEL (eds.), *Fate, Providence and Moral Responsibility in Ancient, Medieval and Early Modern Thought. Studies in Honour of Carlos Steel*, Leuven University Press, Leuven 2014 (Ancient and Medieval Philosophy. Series I, 49), p. 441–454.

<sup>25</sup> STROBINO, *Avicenna’s Theory of Science*, p. 144–145; however, when referring to both terms the very first time (ibid., p. 144), he leaves open the possibility that it be translated either as « referential » or « substantial » – Rahman and Zarepour prefer this latter translation, see SHAHID RAHMAN, MOHAMMAD SALEH ZAREPOUR, « On Descriptive Propositions in Ibn Sīnā: Elements for a Logical Analysis », 2019, hal-02381959 (open access – HAL open science), p. 1.

<sup>26</sup> One wonders why Strobino has not given – at least, in a footnote – a reference to his article on Ibn Sīnā’s logic in the *Stanford Encyclopedia of Philosophy*; see RICCARDO STROBINO, « Ibn Sina’s Logic », in EDWARD N. ZALTA (ed.), *The Stanford Encyclopedia of Philosophy* (Fall 2018 Edition), URL = <<https://plato.stanford.edu/archives/fall2018/entries/ibn-sina-logic/>>, especially note 3: « The term *dātī* may refer to the essence of the subject (as long as it exists), to the substance of the subject (as long as it exists) or, on a more deflationary reading, simply to the subject itself (as long as it exists). In the literature, various translations can be found corresponding to these readings. The interpretation turns on what constraints should be put on the kinds of terms that may count as subjects of a *dātī* proposition. In particular, the question is whether a *dātī* proposition may take an arbitrary term as its subject (in which case it would be just a “referential” proposition, i.e. one that merely fixes the referent, whatever the latter may be) or whether it requires a substance term or an essence term ».

reading clearly prevails in the context of scientific discourse, as Strobino convincingly shows on the basis of a few text-fragments of *Burhān*, II.1. Precisely thanks to his descriptive reading of universal propositions, Ibn Sīnā can understand the omnitemporality in them as related to « all the times at which they are described by the subject ». <sup>27</sup> He hereby opens the door for qualifying many more acts of knowledge as genuinely scientific than was the case with Aristotle and his followers. A further advantage of the descriptive reading – and this, in sharp contrast with the ‘referential’ reading – is that it allows him to express adequately the intended meaning of negation in the case of universal scientific propositions. <sup>28</sup> But, above all, Ibn Sīnā expresses a major distinction between necessity in essence or nature and necessity in implication when discussing the critical role of modal concepts in the domain of demonstration. This distinction unmistakably forms the basis for his revision of the concept *καθ' αὐτό*, « per se », as articulated in Aristotle’s *Analytica Posteriora* A 4 – especially the case per se 1 and per se 2. Ibn Sīnā links the distinction between both with the distinction between containment (*taḍammun*) and necessary implication (*lāzim* or *iltizām*), where the former expresses a strong form of necessity (namely, one that typifies the relation between something and its intensional elements), and the latter only a weaker form of necessity (i.e., one that exists between two notions of which one is inseparable from the other). These distinctions, as Strobino justly notes,

are further associated by Avicenna with another distinction, in this case between two types of inseparability, developed in the commentaries on the *Isagoge*. The first type is inseparability in conception (*taṣawwur*), and its counterparts are the notions of per se 1 and of containment; the second type is inseparability in imagination (*tawahhum*), and its counterparts are the notions of per se 2 and of necessary implication. <sup>29</sup>

In this framework, the fundamental revision that Ibn Sīnā makes regarding Aristotle’s per se 2 is of the highest importance in view of his project to offer a more realistic, and, at once, adequate view of what makes scientific knowledge genuinely scientific, or to put it in Strobino’s own words:

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<sup>27</sup> STROBINO, *Avicenna’s Theory of Science*, p. 150.

<sup>28</sup> STROBINO, *Avicenna’s Theory of Science*, p. 153. Strobino offers this insight, based on IBN SĪNĀ, *al-Shifā’*, *al-Burhān* II.1, p. 123, 21 – 124, 2, translated as text 6.9 (*ibid.*, p. 151–152) – the translation is not very literal, but still *ad sensum*. For example, « negating » renders twice the Arabic expression *khulūw ‘an*, « the being empty of », and near the end, « subject » corresponds to the Arabic word *waḍ’*, « imposition », which however, as such, makes little sense, unless one understands it as an ‘imposition of being with a subject’. Here, a note would have been highly welcomed, not at least, because we can imagine as well that Strobino has judged that a correction of *waḍ’* into *mawḍū’* is on doctrinal grounds more natural, or even required.

<sup>29</sup> STROBINO, *Avicenna’s Theory of Science*, p. 338.

Avicenna uses a variety of terms ([...]). The important philosophical contribution of these distinctions is that ([...]) its overarching goal is to develop a mature theory of per se, one that is capable, at least in principle, of accounting for as many variations of predicates as are found in the sciences. Avicenna's account of per se 2 intentionality reflects this underlying complexity. ([...]). The central question of Avicenna's theory of per se 2 can therefore be formulated as the problem of finding, for any given scientific proposition, the essential factor in virtue of which the predicate is a per se 2 attribute of the subject. Generally speaking, the essential factor is either the subject itself or something in the essence of the subject, that is to say, one of its constituents.<sup>30</sup>

The expression « essential factor » has no correspondence in Ibn Sīnā, but has been forged by Strobino for the sake of simplicity, because he is convinced that Ibn Sīnā tacitly worked with a kind of general notion of the same kind. But why did the latter never express it himself? In view of the postulate of Euclid's geometry that the crucial passages in *Burhān*, II, 2 – where Ibn Sīnā presents two lists of such per se 2 attributes – pose serious problems of interpretation, one can at best detect the general gist of his profound thought on this issue, as Strobino himself observes.<sup>31</sup> I wonder whether this lack of clarity is not due to the fact that Ibn Sīnā, at the time of the composition of the *Burhān*, was still struggling with elaborating a more viable interpretation of Aristotle's view on per se. I do not want to deny that Ibn Sīnā's logic is basically an essentialist logic, as is evidenced, *inter alia*, and, in my view, above all, by his distinction between constituent (*muqawwim*) and implicate (*lāzim*).<sup>32</sup> Rather, I want to underline that some of Ibn Sīnā's wordings are far from being as crystal-clear as one might expect. Strobino is aware of this, but perhaps overly relativises – unless I am mistaken – their impact in the name of an encompassing coherence, as already indicated before, or based on extrapolations, which may reveal in the final analysis to be correct but are clearly in need of a more in-depth justification.<sup>33</sup>

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<sup>30</sup> STROBINO, *Avicenna's Theory of Science*, p. 167–168.

<sup>31</sup> STROBINO, *Avicenna's Theory of Science*, p. 188–191. Cf. also RICCARDO STROBINO, « Per se, Inseparability, Containment, and Implication: Bridging the Gap Between Avicenna's Theory of Demonstration and Logic of Predicables », *Oriens*, 44 (2016), p. 181–266, and with regard to a detailed discussion of the two lists in *Burhān*, II, 2, *ibid.*, p. 190–200 (and in addition *ibid.*, p. 225, n. 78, where different possible interpretations of the example, which illustrates the second case of list one, are given – the last proposed one seems to be preferable, not at least because it implies an intimate connection with the Euclidian parallel postulate).

<sup>32</sup> A constituent is a genuine essential attribute, whereas an implicate is any necessary attribute of something; see STROBINO, *Avicenna's Theory of Science*, p. 185, who, at once, rightly stresses that Ibn Sīnā does not consider the distinction between inseparability in conception and inseparability in imagination to have a merely psychological basis, and hence to be logically spurious.

<sup>33</sup> See above, p. 00 [3–4 here], regarding the former, and p. 00 [8–9 here], regarding the latter.

The issue of causality is central to Ibn Sīnā's theory of science. It places a crucial role in his distinction between that-demonstration and why-demonstration, and their respective subdivisions. Of particular interest is Ibn Sīnā's « identification of different types of causal demonstrations based on their distinct explanatory roles ». <sup>34</sup> In the framework of highlighting the difference between both types of demonstration, Ibn Sīnā presents sign (*dalīl*) as a non-absolute that-demonstration, namely implying that the middle term is effect of the major term. <sup>35</sup> In the explanation of how there can be a demonstration in one science that is both a that-demonstration and a why-demonstration of one and the same thing, it functions as a that-demonstration. More precisely, it covers the case where in such a demonstration one of the two deductions fails to express a cause and, given the possibility of their conversion, the middle term of the first deduction is an effect of the middle term of the second deduction, as evidenced by two examples derived from Aristotle's *Posterior Analytics* A 13. However, Ibn Sīnā adds a third example, which concerns the halo, i.e. its steadiness (*thabāt*) as offering an indication that rain is pouring forth from the cloud in which the halo (comes about), and which is qualified by Strobino as « less straightforward ». <sup>36</sup> However, Ibn Sīnā clearly distinguishes this example from the two other examples, by qualifying it as an illustration of a case where the middle term of the first deduction is neither the cause nor the effect of the middle term of the second deduction. Based on what follows in the text, it seems to constitute a weaker form of « sign », for which Ibn Sīnā uses a specific and new technical term, i.e. *'alāma*, an indicative, non-necessary sign. <sup>37</sup> As to the distinction between that-demonstration and why-

<sup>34</sup> STROBINO, *Avicenna's Theory of Science*, p. 221, where he, although with due prudence, also notes that Ibn Sīnā seems to be the first interpreter in the history of philosophy to have done this. Since he was clearly familiar with al-Fārābī's logical works, even with parts now lost (see e.g., WILFRID HODGES, « Remarks on al-Fārābī's Missing Modal Logic and its Effects on Ibn Sīnā », *Eshare. An Iranian Journal of Philosophy*, 1/3 (2019), p. 39–73, *passim*), one cannot totally exclude that he has been inspired in this respect by the (possibly having existed, but now lost) *Sharḥ al-burhān* of his famous predecessor – an indication for its existence seeming to be present in Albert the Great's Commentary on the *Posterior Analytics*, see my « Albert le Grand et sa connaissance des écrits logiques arabes: une réévaluation du dossier Grignaschi », in JULIE BRUMBERG-CHAUMONT, *Ad notitiam ignoti. L'Organon dans la translatio studiorum à l'époque d'Albert le Grand*, Brepols, Turnhout 2013 (*Studia Artistarum*, 37), p. 225–57, especially p. 236–242.

<sup>35</sup> IBN SĪNĀ, *al-Shifā', al-Burhān* I.7, p. 79, 19–20.

<sup>36</sup> STROBINO, *Avicenna's Theory of Science*, p. 233. Unfortunately, in his presentation of Ibn Sīnā's argument, he omits at the beginning the crucial notion « steadiness », since it is not the halo as such, but the very phenomenon of its steadiness that indicates that rain is pouring forth from the cloud (*saḥar*) in which the halo comes about. The ultimate source for this idea is almost certainly Aristotle's *Metereology* III. 3, 372b20–24.

<sup>37</sup> Ibn Sīnā, both in the *Qiyās* (see IBN SĪNĀ, *al-Shifā', al-Mantiq, al-Qiyās*, IX.24, ed. SA'ĪD ZAYED, *Al-Hay'ā al-'amma li-shu'ūn al-maṭābī' al-amīriyya*, Cairo 1964, especially p. 575, 11–12) and the *Khiṭāba* of the *Shifā'* (see IBN SĪNĀ, *al-Shifā', al-Mantiq, al-Khiṭāba*, I.6, ed. MUḤAMMAD S. SĀLIM, *Al-Maṭbā'a al-*

demonstration in different sciences, it is based on whether a science gives the proximate (why) or the remote (that) cause of the nexus between subject and predicate. It forms the basis for the subordination of the sciences in terms of their explanatory power. In *Burhān* III, 3, Ibn Sīnā distinguishes between three types of subordination: complete, partial, and relative to an individual question. Earlier (namely in II, 9) he had made a three-fold distinction as well, which has in common with the former the first and the last type. However, instead of partial subordination it mentions the case where the principle of a higher science is proved in a lower science – this case is explicitly qualified as the « less frequent ». Strobino explains well how Ibn Sīnā was aware of the risk of circularity and succeeded in circumventing it.<sup>38</sup> Before offering the just mentioned distinction in II, 9, Ibn Sīnā, in II, 8, had dealt with examining how an explanatory premise or term from one science may be passed on to another science, a process that he designates by the terminus technicus *naql al-burhān*, « transfer of demonstration ». Ibn Sīnā specifies two fundamental modes of transfer, i.e. (1) how the conclusion of a demonstration in a science becomes the premise of another demonstration in another science, and (2) how the conclusion of a demonstration in a science is proven by means of a middle term taken from another science.<sup>39</sup> Immediately hereafter, he identifies two fundamental manners of taking the terms of demonstration, based on the per se relations holding between them.<sup>40</sup> Here one detects in a particular manner how crucial Ibn Sīnā's proper doctrine of per se is for his view on the way in which sciences are related to and can interact with one another.

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amīriyya, Cairo 1964, especially p. 43–45) presents as a weaker form of sign. However, it must be examined in detail whether this may be also the case in his *Burhān*.

<sup>38</sup> STROBINO, *Avicenna's Theory of Science*, p. 255–257. In this context, he refers also to IBN SĪNĀ, *al-Shifā', al-Ilāhiyyāt* I.3, p. 19, 10 – 20, 11. However, the last case in the *Burhān*, which mentions the use of principles assumed from the lower science is only allowed when they are proved by means of principles that are evident by themselves, by sensation (*ḥiss*), or 'experience' (*tajriba*), seems to have been reformulated in the *Ilāhiyyāt*, insofar as « evident by themselves » in this latter becomes a separate case, and a third case is mentioned, i.e. the calling principle of a science a principle that does not explain the cause (and, as such, not truly a principle), as, for example calling sensation a principle, namely in the sense that it, inasmuch as it is a sensation, becomes a principle that bestows only knowledge of existence. This reformulation has, in all likelihood, been inspired by a will to highlight the specific baure of metaphysics as the highest science, and therefore the only science that never gives a that, while expecting the answer to the why from a higher science.

<sup>39</sup> IBN SĪNĀ, *al-Shifā', al-Burhān*, II, 8, p. 169, 4–15; English translation (and explanation) STROBINO, *Avicenna's Theory of Science*, p. 259–260, Texts 10.6–7.

<sup>40</sup> IBN SĪNĀ, *al-Shifā', al-Burhān*, p. 169, 16 – 170, 6; English translation STROBINO, *Avicenna's Theory of Science*, p. 259, Text 10.8 – at lines 10–11 of the translation, one reads: « either in [at least] one of the [two sciences] or », but, as far as I can see, nothing corresponds in the Arabic text to these words, or even would suggest that they have been omitted there accidentally (e.g., due to a copyist's error at an early moment of the transmission of the text).

Finally, the centrality of the four (Aristotelian) causes for Ibn Sīnā's theory of science is beyond doubt. In the *Burhān*, he not only offers no less than three different classifications, but he also refines substantially Aristotle's account by linking with each of them a set of distinctions, as e.g., essential/accidental, universal/particular, and so on. They find applications in both the domains of demonstration and definition. An interesting illustration here forms the requirement that a complete definition must include all the essential causes that are relevant to the definiendum. However, « essential » is here potentially ambivalent. As Strobino judiciously notes, it « may be taken, in this context, either in a narrow sense, as equivalent to formal, or in a broader sense, to include all four kinds of causes as long as they are causal factors in an essential rather than accidental manner ».<sup>41</sup> With regard to definition, it is worthwhile to note that, for Ibn Sīnā, it is a vehicle of science through conception. In *Burhān* I, 1, he articulates what distinguishes a definition from a description, but he signals for both the existence of a complete and an incomplete type.<sup>42</sup> Most interestingly, with respect to complete definition, he makes a sharp distinction between his understanding, qualified as representing the understanding of those who determine the validity (of what has been said about it) (*al-muḥassilūn*), and the understanding of the literalists (*al-zāhiriyyūn*).<sup>43</sup> Contrary to the latter, who identify the complete definition with a complete description, he insists that if it is expressed by means of essential notions, a complete definition requires that all essential notions are contained in it in such a way that nothing is left aside. An important innovation is also present in Ibn Sīnā's explanation of the acquisition of a definition. It consists in a combination of two methods, i.e. of composition and of division. Ibn Sīnā reduces the role of the latter, which was the traditional method, to a kind of supplement to the former. He specifies the composition method as a bottom up process, while he gives two accounts of it.<sup>44</sup> However, one wonders why he, in his first account, does not give any instructions about how to determine whether a predicate is a quiddity. According to Strobino, Ibn Sīnā does not see it as a problem because for him the constituents of the quiddity are ultimately self-evident.<sup>45</sup> But if this is the very reason, why does Ibn Sīnā, in his second account, point out certain topical principles as helpful for such a determination? Could it not be the

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<sup>41</sup> STROBINO, *Avicenna's Theory of Science*, p. 271.

<sup>42</sup> IBN SĪNĀ, *al-Shifā'*, *al-Burhān*, I, 1, p. 52, 3–20; English translation STROBINO, *Avicenna's Theory of Science*, p. 289–290, Text 12.1.

<sup>43</sup> Regarding the meaning of « literalists » in this context, see GUTAS, *Avicenna and the Aristotelian Tradition*, p. 14, n. 14 and p. 15, n. 16 (STROBINO, *Avicenna's Theory of Science*, p. 290, n. 7, refers to the 1988 edition, but note that the reference to [p. 26,] n. 16 must be corrected in 'n. 15'). According to Ibn Sīnā, the literalists are guilty of a superficial reading of the traditional philosophical works, particularly in logic.

<sup>44</sup> For a detailed outline, see STROBINO, *Avicenna's Theory of Science*, p. 314–321.

<sup>45</sup> STROBINO, *Avicenna's Theory of Science*, p. 317.

case that an extensive discussion of such topical principles was in his eyes inappropriate inside a book on demonstration? I must confess that this is an open question. A final remark concerning Ibn Sīnā's theory of definition acquisition concerns its underlying epistemological optimism, the presence of which can indeed hardly be denied in the *Burhān* of the *Shifā'*. But, as Strobino observes, albeit in a note, it « appears, on occasion, to run counter to some of Avicenna's own measured statements ». <sup>46</sup> He illustrates this « on occasion » by referring to two passages in Ibn Sīnā's *Kitāb al-Ḥudūd*, *Book of Definitions*. Undoubtedly, this non-negligible difference between both works deserves a separate, in-depth investigation. A possible explanation for the difference, which I, however, present with due prudence, could come from identifying the *Hudūd* as a relatively early work. Most interestingly, in the *Ilāhiyyāt* of the *Shifā'*, V, 7, a similar kind of scepticism is expressed. <sup>47</sup>

As indicated at the beginning, what I have discussed so far gives, at best, a very partial idea of the rich content of Strobino's book. <sup>48</sup> Nevertheless, I hope that my interrogations and critical remarks may constitute a modest contribution to a further exploration of Ibn Sīnā's theory of science. It is complex and difficult, and I therefore am convinced that the scholarly community will be grateful to Strobino for having written this pioneering study, which undoubtedly will form a serious point of departure for many further studies. In his final conclusion, Strobino himself indicates a major topic in this respect, i.e. the relation between Ibn Sīnā's logic of scientific reasoning and his account of the ultimate goal of human life, as being identified with the experience of purely intellectual pleasure in the afterlife. This identification is indeed true for the elite. But Ibn Sīnā seems to accept for the

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<sup>46</sup> STROBINO, *Avicenna's Theory of Science*, p. 314, n. 13.

<sup>47</sup> See IBN SĪNĀ, *al-Shifā'*, *al-ilāhiyyāt* V.7, especially p. 237, 15–238, 3; English translation STROBINO, *Avicenna's Theory of Science*, p. 165, n. 2 (note, however, that Strobino quotes the passage in the context of his discussion of per se 1 attributes, not of definition). The anonymous reviewer kindly drew my attention to this important fact. However, determining the precise degree of similarity between this passage in the *Ilāhiyyāt* of the *Shifā'* and what Ibn Sīnā affirms in the *Hudūd* requires a detailed comparison of the wording in both works. This clearly exceeds the scope of the present review article.

<sup>48</sup> Let me stress that appendices A (Conditions of Certainty) and B (The Logic of Scientific Reasoning) constitute a worthy supplement to the ideas expressed before. As to Appendix C (A Map of *Kitāb al-Burhān* [Book of Demonstration]), it is generally helpful, but is in my view at times open to minor improvements, as e.g. I.8 (Ibid., p. 359), where I believe that it would be better to limit the first thematic issue distinguished to « causal and non-causal certainty », and, hereafter, to articulate a second thematic issue under the heading « demonstration and certainty » (including subdivisions [largely corresponding to 2–4 of the actual presentation] which cover the rest of the chapter). Most useful are the English-Arabic Glossary presented in appendix D (even if one may somewhat regret the absence of its Arabic-English counterpart), the extant bibliography, as well as the indices of subjects (lacking, regrettably, an index of names), quoted lemmata and referenced passages.

masses a kind of « imaginal » resurrection, as Michot has labelled it.<sup>49</sup> As usual, things turn out to be complicated in Ibn Sīnā's thought, but Strobino suggests a most interesting topic for further research.

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<sup>49</sup> JEAN (Y.) R MICHOT, *La destinée de l'homme selon Avicenne. Le retour à Dieu (ma'ād) et l'imagination*. Peeters, Leuven 1986 (Académie Royale de Belgique. Classe des Lettres. Fondation René Draguet, 5), *passim*, but especially chapters 1 and 5.